Munzing
structural engineering

STRUCTURAL CALCULATIONS

Entry Awning Deferred Submittal
4531 NE Garfield Ave. Unit #A, Portland, OR 97211

(City of Portland Permit # 2019-252431-RS)

Specialty Metal Fabricators, LLC

SHOP DRAWING/SUBMITTAL REVIEW
☒ APPROVED ☐ APPROVED AS NOTED
☐ REVISE & RESUBMIT ☐ REJECTED
SUBMITTAL WAS REVIEWED FOR DESIGN CONFORMITY AND GENERAL CONFORMANCE TO CONTRACT DOCUMENTS ONLY. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING DIMENSIONS AT JOBSITE FOR TOLERANCE, CLEARANCE, QUANTITIES, FABRICATION, PROCESSES AND TECHNIQUES OF CONSTRUCTION. COORDINATION OF HIS WORK WITH OTHER TRADES AND FULL COMPLIANCE WITH CONTRACT DOCUMENTS.
BY: G.Wright DATE: 6/15/2021
EMERIO DESIGN

LIMITATIONS

Engineer was retained in a limited capacity for this project. Design is based upon information provided by the client who is solely responsible for accuracy of same. No responsibility and/or liability is assumed by or is to be assigned to engineer for items beyond that shown on these sheets.

Project No. 21-175
June 11th, 2021

CLIENT: Specialty Metal Fabricators
PROJECT: NE Garfield Awning
PROJECT NUMBER: 21-175
DATE: 06/11/2021
BY: Munzing Structural Engineering

Design Criteria

General
Building Department .....City of Portland
Building Code/Year.....2018 IBC/2019 OSSC

Roof Loads
Snow Load.....25 psf
Dead Load .....15 psf

Wind Loads
Design Wind Speed (3-Sec Gust).....98 mph
Exposure.....B

Seismic Loads
Project Site Zip Code.....97211
Seismic Soil Site Class .....D
Special Seismic Ordinances/Notes: None

Additional Ordinances/Notes:

- Awning Designed for Snow Drift, Wind uplift, (Seismic by inspection)

Snow Drift Calculation

Design per 2009 International Building Code - ASCE 7-05 Sections 7.7, 7.8 and 7.9

LOW ROOFS AND DECKS :

ASCE 7.7.1 and 7.9

Design Snow Load(Pg) =	25.0	psf	-- Minimum Allowed At End of Drift Slope
Ce =	1.0		-- IBC Table 1608.3.1
Ct =	1.0		-- IBC Table 1608.3.2
Is =	1.0		-- ASCE Table 7-4
Length of Upper Roof (lu) =	66.0	ft.	
Length of Lower Roof (W) =	4.0	ft.	-- Required for Sliding Snow Load calcs only
Height Difference (ho) =	14.50	ft.	
Lower Roof Slope :12 =	0		-- Minimum Pf applies for slopes < 3:12
Upper Roof Slope :12 =	0		-- Include Sliding Snow for slopes > 2:12

Roof Snow Load (Pf) =	25.0	psf	Pf = 0.7*Ce*Ct*I*Pg > 20*I
Sliding Snow (Pss) =	0.0	psf	(0.4*Pf*W)
Snow Density(D) =	17.25	pcf	γ = 0.13Pg + 14 <= 30
Design Snow Height (h_b) =	1.45	ft.	$h_b = P_f/\gamma$
Clear Height (hc) =	13.05	ft.	hc = ho - hb
hc / hb =	9.01		
Drift Height (h_d) =	2.72	ft.	h_d = 0.43(lu^0.33)((Pg+10)^.25)-1.5
Snow Height (hb+hd) =	4.17	ft.	
Max. Snow Load (P_d) =	**71.9**	psf	Pd = γ(hd+hb) Note: Pd Decreases to Pg linearly
Drift Width (w) =	10.88	ft.	hd <= hc then w = 4hd -- hd > hc then w = $4hd^2/hc$
Drift Width (w) =	72.04	ft.	w < 8hc
Controlling Drift Width =	**10.88**	ft.	

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Project No.	Sheet No.

Project	Date
GARFIELD	
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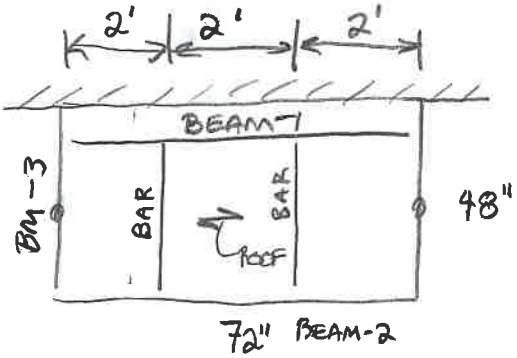
CANOPY	



PLAN VIEW

LOADING:

SNOW = 25 PSF

SNOW DRIFT:

$h_b = 1.45'$ $\quad \gamma = 17.25$ PCF

$h_d = 2.72'$

$w = 10.88'$

CHECK ROOF:

D = 5 lb/ft²

S = 25 + 17.25 = 42.25

$\frac{h_d}{10.88} = \frac{x}{4} \Rightarrow x = 1'$

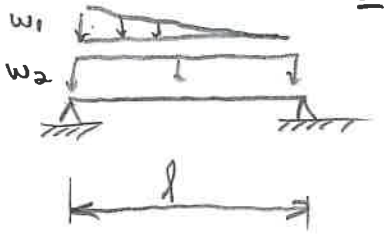
$M_{ALL} = \frac{F_y Z}{1.67} = \frac{36(12t^2)}{1.67(4)} = 64.67t^2$

∴ SNOW DRIFT = 1(γ) = 17.25
w = 4'-0" LIMITED BY LENGTH OF CANOPY

$M_{REQ'D} = \frac{47.25(24^2)}{1000\ 8(12)} = .284 \le 64.67t^2 \Rightarrow t \ge .066$" ∴ USE 14 GA = .0785"

CHECK BARS:

D = 10 PSF $\quad l = 40" = 3.33'$: $w_1 = 17.25$ PSF; $w_2 = 10 + 25 = 35$ PSF



$M_{MAX} = \frac{(2)35l^2}{8} + .1283\left(\frac{17.25(2)l}{2}\right)l$

$= 122$ FT-LBS $= 1.46$ K-IN

TRY HP11/GAX7: $L_b = 12"$ $\quad d = 7"$ $\quad t = .12"$ $\quad \frac{Lbd}{t^2} = 5833 > \frac{1.9E}{F_y} = 1530$

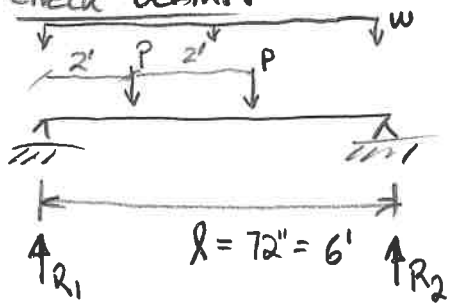
$M_n = F_{cr} S_x \le M_p$ $\quad M_p = F_y Z = 36\left(\frac{.12(7^2)}{4}\right) = 53$ K-IN

$F_{cr} = \frac{1.9EC_b}{\left(\frac{Lbd}{t^2}\right)} = 9.45$ $\quad S_x = \frac{12(7^2)}{6} = .98$ $\quad \therefore M_n = 9.26$

$M_{all} = 9.26/1.67 = 5.5 > 1.46$ OK

$w = (10 + 25 + 17.25) \cdot 3.4' = 17.8$ PLF

CHECK BEAM 1:



$P = (10+25)\,2\left(\frac{3.33}{2}\right) + \frac{17.25(2)\,3.33/2\,(2)}{3} = 155\#$

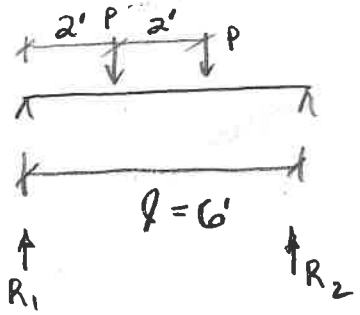
$M_{MAX} = P\left(\frac{\ell}{2}\right) + \frac{17.8(6^2)}{8} = 390 \text{ FT-LBS} = 4.68 \text{ K-IN}$

$M_{MAX} = 4.68 < M_{ALL} = 5.5$ ∴ OK

$R_1 = R_2 = 208\#$

CHECK BEAM -2:

$P = (10+25)\,2\left(\frac{3.33}{2}\right) + \frac{17.25(2)(3.33/2)}{3} = 136\#$ $\quad R_1 = R_2 = 136\#$



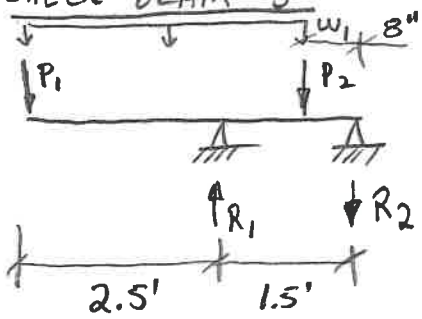
$\frac{Lbd}{t^2} = \frac{12(12)}{.12^2} = 10{,}000$ $\quad F_{cr} = \frac{1.9E}{\left(\frac{Lbd}{t^2}\right)} = 5.51$ $\quad S_x = \frac{bd^2}{6} = 2.88$

$Z_x = \frac{bd^2}{4} = 4.32$

$M_n = F_{cr} S_x = 15.86 < M_p = F_y Z = 156$

$M_{ALL} = \frac{15.86}{1.67} = 9.5 \text{ K-IN} > M_{MAX} = \frac{P(2)(12)}{1000} = 3.26 \text{ K-IN}$ ∴ OK

CHECK BEAM -3:



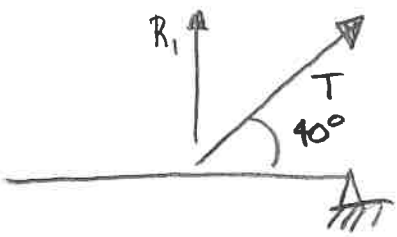
$w_1 = 10(1') = 10$ PLF

$P_1 = 136\#$ $\quad P_2 = 208\#$

$R_1 = .54$ K

$R_2 = -.072$ K

$M_{MAX} = .382 \text{ K-FT} = 4.6 \text{ K-IN} < M_{ALL} = 9.5$ ∴ OK



$R_1 = .54$ K

$T = \frac{R_1}{\sin(40)} = .84$ K ∴ USE ½"Ø ROD W/ #2 CLEVIS W/ ¾" PIN

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WIND:

$P = q_h (GC_p)$

WIND RISK CAT = II V = 98 MPH $K_d = .85$

EXP = B $K_v = 1$ $K_e = 1$

$K_z = K_h = .7$ $z = h = 30'$ $K_{zt} = 1$

$q_h = q_z = .00256\, K_z K_{zt} K_d K_e V^2 = 14.62$ PSF

$h_c = 18'$ $h_e = 30'$ $h_c / h_e = .6$ $GC_{pn} = -.75$

$P = -10.97$ PSF

UPLIFT $= 10.97(.6) = 6.58 < 15$ PSF OK

SEISMIC IS OK BY INSPECTION